

Examiner during that interview, and it is respectfully submitted that this application distinguishes over the art of record at least for the reasons presented at that meeting.

By this Amendment After Final Rejection Applicant seeks to amend claim 1 and to present new claims 41 and 42 in accordance with discussions during the personal interview. Upon entry of this Amendment claims 1, 41 and 42 will be independent.

Attached hereto is a marked-up version of the changes made to the claims by this amendment. The attached page is entitled "Version With Markings To Show Changes Made".

As explained in detail below, Applicant has made a diligent effort to place this application in condition for allowance. Should, however, the Examiner deem otherwise, or deem only some of the pending claims to be allowable, the Examiner is respectfully requested to telephone the undersigned attorney at the number listed below to discuss how allowance of this application could be expedited.

Claims 1-24 and 40 have been rejected under 35 U.S.C. 103(a) as being unpatentable over what the Examiner characterized as Applicant's admitted state of the art in the specification on pages 1-3 in combination with either U.S. Patent No. 4,588,480 to Thoma, No. 4,938,850 to Rothschild et al., No. 5,603,338 to Beaty, No. 3,650,861 to Angell, No. 4,525,250 to Fahrmbacher-Lutz et al., or No. 3,969,195 to Dotzer et al.

In addition, claims 1, 3-24 and 40 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,298,332 to Andrus et al. in combination with U.S. Patent No. 4,906,524 to Takao, and further in combination with Thoma, Rothschild, Beaty, Angell, Fahrmbacher-Lutz, or Dotzer.

Before turning to the cited art, Applicant notes that, during the interview, the Examiner tentatively indicated it would strengthen certain arguments by Applicant to recite the acts of surface working the titanium-containing piece. Accordingly, Applicant has presented new claim 41, which specifically includes this action. Claim 1 also has been revised to recite such actions in the preamble of the claim, meaning the workpiece used must have been produced in this manner. The claim has been revised in this manner because Applicant, while agreeing to specify the workpiece has been made by any of the recited working processes, does not wish to require the surface working processes and coating be performed by the same person.

As described in claim 1, this invention relates to a method of treating the surface of a substrate containing titanium for an ornament, that surface having been subjected to a honing processing step, a nicking processing step or a mirror finishing step and as a result having a foreign material substance adhered thereto. This is done by providing the surface containing titanium, eliminating the substance adhering to the surface of the substrate, and forming a transparent protective layer containing glass. The protective layer is formed by selecting a glass coating liquid containing water and having a viscosity that is between 200-500 cps at 25°C when the substrate has been subjected to the honing processing step or the nicking processing step, and that is between 150-250 cps at 25°C when the substrate has been subjected to the mirror finishing step, applying the selected glass coating liquid to the surface from which the adhered substances have been removed, and drying the surface.

The portion of the application characterized as "admitted art" only recognizes that there are known methods for coating metals, and that it is desirable to use Ti-containing materials for ornamentation, but that such material is subject to undesirable oxidation.

As explained during the April 15 interview, each of the Thoma, Rothschild, Beaty, Angell, Fahrmbacher-Lutz and Dotzer references only teaches cleaning oxides or surface debris from a surface including titanium and coating the cleaned surface with materials other than glass.

Thoma teaches that in order to improve wear properties of structural parts, Ti is etched with acid and then nickel is coated thereon. This results in a Ti-Ni diffusion layer between the Ti and Ni layers. The Ni is then removed, leaving the Ti-Ni diffusion layer exposed (col. 2, lines 44-49 and 61-64; col. 3). Thus, while Thoma may teach cleaning a Ti-containing workpiece, Thoma is silent regarding coating that workpiece with glass, much less doing so in the manner claimed, whereby the viscosity of the applied coating liquid is selected according to the manner in which the workpiece was surface worked.

Rothschild also teaches that Ni is plated on titanium that was cleaned in an acid solution (col. 2, lines 26-52; col. 3, lines 2-29). Again, this reference does not suggest coating the workpiece with glass, or that the viscosity of the coating liquid used be chosen according to the manner in which the surface was worked.

As with the other references, while Beaty teaches cleaning an oxide layer from the surface of a titanium piece (col. 4, lines 56-58), Beaty does not teach coating the cleaned piece with glass. Rather, Beaty, which is directed to bone implants, teaches that the titanium piece be coated with bone growth promoting material (col. 5, lines 45-57), and so Beaty actually teaches away from the claimed invention. Beaty too is silent regarding coating a workpiece with glass, much less doing so as claimed, whereby the viscosity of the applied coating liquid is selected according to the manner in which the workpiece was surface worked.

Angell also only teaches cleaning a titanium surface and coating the cleaned surface with certain materials (not glass) (col. 1, lines 36-63). Angell does not teach coating a workpiece with glass, or that the viscosity of the applied coating liquid is selected according to the manner in which the workpiece was surface worked.

Both Fahrmbacher-Lutz and Dotzer clean titanium surfaces, but they do so in a way which bars their combination with the other art. These reference specifically require the oxide layer on the surface of the titanium material be removed in the absence of water (Fahrmbacher-Lutz col. 2, lines 55-66 and Dotzer, col. 3, lines 41-50). Moreover, Fahrmbacher-Lutz and Dotzer both teach coating the workpiece with metal (Fahrmbacher-Lutz, col. 2, lines 13-22 and col. 3, lines 35-46 and Dotzer, col. 8, lines 19-45).

As also pointed out during the interview, Fahrmbacher-Lutz and Dotzer both specify that cleaning and coating must take place without the presence of water. Accordingly, these references are not properly combined with Thoma, Rothschild, Beaty, Angell, Fahrmbacher-Lutz and Dotzer, all of which speak of cleaning using aqueous acid solutions.

Nor do Andrus and Takao remedy the deficiencies of these other references with regard to the coating material. It is noted that the Office Action states "Andrus et al. (5,298,332 in combination with Takao (4,906,524) teach applying ceramic-based coating on ornamental titanium articles." (Office Action, p. 4) (emphasis added). Even assuming *arguendo* that this is true, this still does not suggest the aspect of the claimed invention relating to coating with glass. Nor do these references suggest the viscosity of the coating liquid correspond to the manner in which the titanium-containing article was worked.

In fact, as noted at the personal interview, Andrus teaches away from the claimed invention because Andrus disparages coating with glass:

A common method of protecting materials from oxidation at elevated temperatures is to apply a continuous monolithic glass coating. This completely encapsulates and isolates the material from the surrounding atmosphere; however, viscous flow of the glass coating may occur when large surface stresses develop during high temperature use. In that case, a glass barrier coating tends to develop thin spots and fails catastrophically. (col. 1, lines 39-43)

Andrus then teaches away from the claimed invention because Andrus disparages glass coatings, and instead applies a crystalline glass-ceramic coating.

Even if Andrus is considered to teach glass coatings, Andrus does not suggest the aspects of this invention involving the use of a coating liquid whose viscosity reflects the manner in which the titanium-containing article was surface worked.

Applicant also notes that during the personal interview there was discussion distinguishing Andrus' crystalline coating from an amorphous glass coating. As the Examiner helpfully suggested, Applicant has presented herewith new claim 42 to reflect this difference. It is noted that during the interview this subject matter was not said to constitute new matter.

As for Takao, that patent teaches applying a ceramic-based hard coating by a dry-process plating method (col. 3, lines 11-18; col. 4, lines 57-67). Takao in no way suggests forming a glass layer, and, by specifying the use of a dry process, clearly does not suggest and in fact teaches away from the aspects of the claimed invention providing for applying a coating liquid.

It also should be noted that Takao suffers from the same deficiencies as the other art in that Takao does not suggest the aspects of this invention involving the use of a coating

liquid whose viscosity reflects the manner in which the titanium-containing article was surface worked.

As for the remaining claims, those claims all ultimately depend from and so incorporate by reference all the features of claim 1, including those features shown to avoid the cited art. These claims therefore patentably distinguish over that art at least for the same reasons as claim 1, which reasons are incorporated by reference herein.

Newly-presented claims 41 and 42 also avoid the cited art, since they provide for coating the worked titanium-containing surface with glass. In the case of claim 41, that claim also provides for specific types of working, and claim 42 provides that the glass coating is amorphous. None of the cited references suggest these features.

For all the foregoing reasons, Applicant's claimed invention patentably distinguishes over the cited art. Accordingly, favorable reconsideration and withdrawal of this rejection are respectfully requested.

CONCLUSION


Applicant respectfully submits that all outstanding rejections and objections have been addressed and are now either overcome or moot. Applicant further submits that all claims pending in this application are patentable over the prior art. Reconsideration and withdrawal of those rejections and objections is respectfully requested.

In view of the foregoing revisions and remarks, Applicant respectfully requests entry of this amendment and submit that entry of this amendment will place the present application in condition for allowance. It is further submitted that entry of this amendment can

be approved by the Examiner consistent with Patent and Trademark Office practice, since the changes it makes should not require a substantial amount of additional work by the Examiner. It is believed that the changes presented in this amendment either address matters of form or issues that the Examiner has previously considered.

Lastly, no fee is believed to be due in connection with the claims presented in this Amendment. If, however, the Commissioner deems a fee to be required, the Commissioner is authorized to charge that fee, and any other required fee, to deposit account no. 19-4709.

Respectfully submitted,



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Attachment: "Version With Marking To Show Changes Made"

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Add claims 41 and 42:

--41. (New) A method of treating a surface of a substrate containing titanium for an ornament, comprising the steps of:

providing the surface containing titanium;

machine working the surface by any of a honing processing step, a nicking processing step and a mirror finishing step, and as a result having a substance adhered thereto, the substance being a foreign material,

eliminating the substance adhered to the surface of the substrate ; and

forming a transparent protective layer containing glass by

applying a glass coating liquid containing water on said surface from which said adhered substances have been removed, and

drying said surface.

42. (New) A method of treating a surface of a substrate containing titanium for an ornament, the surface of the substrate having been subjected to any of a honing processing step, a nicking processing step and a mirror finishing step and as a result having a substance adhered thereto, the substance being a foreign material, comprising the steps of:

providing the surface containing titanium;

eliminating the substance adhered to said surface of said substrate from said surface; and

forming a transparent protective layer containing glass by the steps of;
applying a glass coating liquid containing an amorphous glass and water
on said surface from which said adhered substance has been removed, and
drying said surface to form a layer of the amorphous glass on said
surface.--.

Amend claim 1:

1. (Four Times Amended) A method of treating a surface of a substrate containing titanium for an ornament, the surface of the substrate having been subjected to any of a honing processing step, a nicking processing step and a mirror finishing step and as a result having a substance adhered thereto, the substance being a foreign material, comprising the steps of:

providing the surface containing titanium;

eliminating the substances adhered to said surface of said substrate from said surface, ~~said adhered substances resulting from the substrate having been subjected to machine working selected from the group consisting of honing processing, nicking processing and mirror finishing, wherein said adhered substances are foreign materials,~~ and

forming a transparent protective layer containing glass by the steps of;

selecting a glass coating liquid containing water and having a viscosity that is between 200-500 cps at 25°C when the substrate has been subjected to the honing processing step or the nicking processing step, and that is between 150-250 cps at 25°C when the substrate has been subjected to the mirror finishing step,

~~adhering~~ applying the glass coating liquid chosen in the selecting step on
said surface from which said adhered substances have been removed, and
drying said surface.